Marshall University

College of Science

Mathematics Department

MTH 122: Plane Trigonometry

Course catalog description

A study of the trigonometric functions, graphs of the trigonometric functions, identities, equations, inverse trigonometric functions, vectors, complex numbers, and applications.

Credit hours

3 hours

Prerequisites

ACT Math 22 or equivalent, or a grade of C or higher in MTH127 or MTH130

List of topics

1. **Right-Triangle Trigonometry**:
   - Angles & measurements (degrees, minutes seconds, decimal degrees).
   - Arithmetic of angle measures.
   - Similar triangles and ratios of sides of right-triangles.
   - Exact values compared to decimal approximations.
   - Accuracy of approximations.
   - Optional: measurements and rules of rounding values to the appropriate number of significant digits.
2. **Circular Trigonometric Functions:**
   - The unit circle with angles measured in radians.
   - Angles in standard position and trig ratios involving x, y and distance, r, from the origin.
   - Reference angles.
   - Arc length and central angle;
   - linear and angular velocity.

3. **Graphing Trigonometric Functions:**
   - Amplitudes, periods and translations of sines and cosines.
   - Periods, asymptotes and graphs of tangent, cotangent, secant and cosecant.

4. **Trigonometric Identities:**
   - Identities distinguished from conditional equations.
   - Appropriate methods and procedures for verifying identities.
   - Pythagorean, angle-sum, double-angle, half-angle, product-to-sum and sum-to-product identities.

5. **Solving Trigonometric Equations:**
   - Inverse-trig functions.
   - Solving equations which have one or more trig and/or inverse-trig functions.
   - Exact-value solutions versus approximations.

6. **Trigonometric Applications:**
   - Law of sines (including ambiguity) and law of cosines. Solving oblique triangles from appropriate partial information. Optional: solution check using Mollweide's formula.
   - Vectors, operations, and dot product, including physical problems. Solutions will involve oblique triangles.
   - Complex numbers, polar coordinates and polar form. Products, quotients, powers, roots and DeMoivre's Theorem. Optional: notations exp(i theta) and/or cis(theta).

Learner Outcomes

- Understand, and use effectively, all six trig functions, defined both by right triangles and also by the unit circle.
- Graph each of the six trig functions on its extended domain, and know the features of each function.
- Verify trig identities using proper mathematical techniques.
- Solve conditional equations which involve trig and/or inverse-trig functions.
- Given a side and two other values, find all possible triangles, if any.
- Understand vectors and polar-form complex numbers so that physics problems can be solved and so that products, quotients, powers and roots can be computed easily.

Suggested textbooks

- Dugopolski, *Trigonometry*, 4th edition. ISBN 978-0-32-191552-8
- Young, *Trigonometry*, 3rd edition. ISBN 978-0-47-064802-5
- Lial, Hornsby, Schneider, *Trigonometry*, 6th edition.

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